

# ENVIRONMENT

**ABSTRACT:** The environment industry is not a “traditional” national industry. But, in the context of a globalizing world, it is rapidly becoming a vital U.S.-led “international industry” consisting of nongovernmental organizations (NGOs), government, and business. Moreover, the environment is becoming increasingly important as a security issue because of linkages between environmental degradation and potential and actual sources of conflict. These linkages enhance the need to understand and leverage industry in the protection of national security. It is for this reason that a healthy environment industry - to include active NGOs, a responsive policy making arm of the government, and innovative revenue generating companies - should be of interest to all of us.

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## **PLACES VISITED:**

### **Domestic:**

BP Solar, Linthicum, MD.  
Baltimore Resco, Baltimore, MD  
National Oceanic Atmospheric Association (NOAA) Headquarters, Washington, DC  
World Resources Institute, Washington, DC  
Alaska State Governor's Office, Juneau, Alaska  
Alaska State Environmental and Natural Resources Agencies  
National Marine Fisheries Service, Juneau, Alaska  
Coast Guard Headquarters, Juneau, Alaska  
Environmental Protection Agency (EPA), Juneau, Alaska  
Sealaska Native Corporation, Juneau, Alaska  
Southeast Alaska Conservation Council, Juneau, Alaska  
Earth Justice, Juneau, Alaska  
Alaska Toxics Action, Juneau, Alaska  
Alaska Conservation Fund, Juneau, Alaska  
Mendenhall Glacier, Juneau, Alaska  
Denali Commission, Anchorage, Alaska  
Conoco Phillips, Anchorage, Alaska

### **International:**

Mai Po Wetlands Park, Hong Kong  
United States Consulate, Hong Kong  
Yunan University, Kunming, PRC  
Dianchi Lake, Kunming, PRC  
China Environment and Sustainable Development Reference and Research Centre (CESDRRC), Beijing, PRC  
Beijing Municipal Science and Technology Commission, Beijing, PRC  
United States Embassy, Beijing, PRC

## **Introduction**

*Environment – n. 1. The circumstances or conditions that surround one; surroundings. 2. The totality of circumstances surrounding an organism or group of organisms.*<sup>1</sup>

“Why study the environment?” The obvious answer is that we all have a vested interest to ensure our surroundings are, at a minimum, not doing us harm and, preferably, contributing to a healthy life while preserving our natural resources at levels which support sustainable development. Without an understanding of the diverse and intertwined challenges facing the Earth’s ecosystem, we are not well equipped to understand and implement remedies for the harm we are causing to our environment and, by definition, to ourselves. It is against this backdrop that the Spring 2005 Industrial College of the Armed Forces (ICAF) Environment Industry Study (IS) seminar set out to study the environment and gain an understanding of how the “environment industry” contributes to the economic development of the U. S., is connected to the national security of the U.S., and fits into the increasingly globalized world economy

This paper will provide a brief survey of the observations and lessons we have culled from our hours of classroom instruction and discussion and our field studies, that included local day trips, a trip to Alaska and a trip to China.

## **Defining the Industry**

Defining the “environment industry” is not as straightforward as defining a more traditional national security-related industry such as aircraft manufacture or shipbuilding. The Environmental IS seminar eventually arrived at a wide-ranging definition that captured all the pertinent players and forces which shape the industry. In our view, the industry consists of three pillars: environmentally focused non governmental organizations (NGOs) – Sierra Club, World Resources Institute, Greenpeace, etc. – which seek to raise public and government consciousness on environmental issues, thereby gaining momentum to get policies implemented which prevent or correct the perceived harm; the government – international, federal and local – which, often acting on issues raised by environmental NGOs, sets the policies, regulations and laws that protect and preserve our environment; and the revenue generating segment which serves as the “execution” arm of the industry, providing the means to implement protective governmental policies.

The revenue-generating segment of the industry is best defined by Environmental Business International, that breaks out 14 individual segments as seen in table 1:

<b>Services</b>	<b>Equipment</b>	<b>Resources</b>
Analytical Services	Water Equipment and Chemicals	Water Utilities
Wastewater Treatment Works	Instruments and Information Systems	Resources Recovery (recycling)
Solid Waste Management	Air Pollution Control Equipment	Environmental Energy Services
Hazardous Waste Management	Waste Management Equipment	

Remediation/Industrial Services	Process and Prevention Technology	
Consulting and Engineering		

**Table 1. .<sup>2</sup>**

Thus, throughout this paper when we discuss the “environment industry” we will mean the totality of public sentiment, government regulations, and those revenue-generating industries in Table 1 and how they interact in order to protect our environment.

### **Tension Created By Economic Growth Versus Environmental Protection**

One recurring theme the Environment IS saw was the tension created by seemingly having to choose between spurring economic growth or being environmentally sensitive. During our studies we found that developing nations (although this tension exists in developed nations as well) viewed this issue as an either/or situation: they could either promote rapid economic growth and the attendant rise in their standard of living, or they could promote sound environmental protection policies, which they perceived as stifling to economic growth. We witnessed this “either/or” tension during our travels to Alaska and China.

While in Alaska, we met with executives of the Southeast Alaska (SEAlaska) Native Corporation. This corporation owns tracts of land within the Tongass National Forest and has permits to cut timber within the forest. SEAlaska officials told us that they clear cut up to 10,000 acres of forest each year and do not reforest the areas they cut. They explained that the Tongass ecosystem was such that the forest would naturally regenerate itself and federal law did not require them to reforest their harvested areas. While this may be factually correct – the forest may eventually return through natural growth – an Alaskan environmentalist told us that the amount of time required for this natural regrowth would result in a permanently damaged ecosystem as even the tiniest of creatures such as insects would have their habit altered to the point where they may never return. This is one brief example of a company which is more interested in maximizing a profit than it is in being environmentally responsible and creating a sustainable environment which would serve future generations.

During our visit to China, we saw many examples of the propensity to maximize profit at the cost of environmental protection. For example, it was common to see the dumping of raw sewage into rivers and lakes to save provincial governments from having to build expensive wastewater treatment plants. It also was not uncommon to see coal burning power plants that lacked any type of expensive pollution preventing scrubbers.

The Environmental IS came to the realization that this was a “You can pay me now or you can pay me later” scenario. Developing nations seem content to continue with a short term view toward their future and believe that they will be able to correct their environmental degradation issues in the distant future – once they’ve built up their gross domestic product and can afford to devote the fiscal resources that their massive clean up will require. What they fail to comprehend, or acknowledge, is the scale of their impending problem – notably water quality and quantity – and the fact that they are putting the health of their future generations at considerable risk. When pressured by the U.S. Government or U.S. based NGOs about the folly of this approach (money over protection), most developing nations take the stance that “The U.S. polluted its environment when it was developing; we just want the same opportunity to accelerate our development.” However, they fail to draw

the distinction between polluting out of scientific ignorance (as in the U.S.'s early industrial history) or willfully degrading the environment and endangering their future and ours. It is the Environmental IS's opinion that the U.S. Government must remain engaged with developing nations in order to educate and convince them that promoting environmentally sound practices is actually an economically sound principle, and to help them obtain the technology to pursue cleaner economic development.

### **The Environment Industry And National Security**

Once one gains an appreciation for the linkages between environmental degradation and how they may lead to conflict, one can begin to understand the place the environment industry has in the enhancing U.S. national security. Consider the following scenario: a coal fired power plant without high tech scrubbers emits massive greenhouse gasses, which some scientists theorize leads to global warming; global warming creates changes in the Earth's weather patterns, which cause rain patterns to shift resulting in once arable land becoming parched; the parched, non crop producing land causes a migration of refugees in search of a sustainable food source; the refugee migration and subsequent competition for resources leads to conflict. Environmentally driven security problems are not farfetched. They are quite real--witness Darfur, Rwanda, and Haiti to cite just three examples.

There are other, equally tangible examples of environmental abuses that could lead to conflict. Today, major rivers that flow from China into Vietnam and Laos are heavily polluted with Chinese waste. While Vietnam and Laos are too weak to muster any type of forceful response, imagine if the situation were different and both parties in a similar situation had military parity. One could envision that the downstream country may eventually view this as a matter of national security and respond with force. Another example of an environmental issue, which could lead to conflict, is the fight for scarce resources. If countries do not practice environmentally sustainable practices – such as placing limits on a fishing harvest in order to allow the fish stocks to maintain a healthy rate of regeneration – they will eventually exhaust their resources and will be forced to compete with their neighbors for food, water, energy, and arable land. There are numerous other linkages such as these – threads that tie the environment to a potential source of conflict. It is for this reason that the U.S. Government must factor the environment and the environment industry into its consideration when determining how to best provide for our national security.

The Environment IS seminar concluded our study with a recommendation that the U.S. Government should author a comprehensive National Environmental Strategy (NES) that would parallel the National Security Strategy. The NES, as we envision it, would be the product of the interagency process and would focus all federal efforts as regards the environment and environment industry (per the opening definition) in order to achieve synergistic effects between the government, NGOs, and revenue-generating segment. The NES would tie diplomatic efforts among developing nations with informational campaigns to educate them on the hazards their environmental degradation is causing and would link economic aid and incentives to these efforts. By having a document that fully leverages our instruments of national power in order to further environmentally responsible and sustainable practices, the U.S. would be setting the conditions to reduce potential future conflict. This, in turn, would further our national security interests.

## **Environmental Challenges For the 1<sup>st</sup> Century**

The United States has made great strides toward the conservation and preservation of our environment over the last 25 years. Our nation's air, land, and water are in many cases, significantly cleaner than they were only a few decades ago. At the same time, some environmental problems are getting worse, and much more remains to be done.<sup>3</sup> As our nation moves into the 21<sup>st</sup> century, it is apparent that the approach we are taking toward natural resource use (including energy) and environmental protection require modification to successfully address the long-term stresses affecting so many of our nation's and world's natural ecosystems.<sup>4</sup> Evidence of this stress can be found on many fronts, including depleted fresh water supplies, deteriorating fisheries, multiple energy crises, global climate change, and accelerated loss of biodiversity. Consequently, the major environmental challenges facing us in the 21<sup>st</sup> century include: global climate change, energy, population and food, water, marine degradation, and declining forests. All of these areas have profound implications and provide unique opportunities for U.S. industries, technological prowess, and security interests.

### ***Challenges***

*Global Climate Change* – Evidence shows that our environment and the global climate system are changing. The effects of climate change on ecological systems and human society could be both profound and irreversible. These effects may include damage to vulnerable ecosystems, loss of key plant and animal species, rainfall patterns that can lead to floods and drought, damage to coastal and permafrost areas, economic dislocations, and increased incidence of human disease.<sup>5</sup>

*Energy* – The first half of the 21<sup>st</sup> century will have to meet two major challenges: supplying energy to everyone in an equitable manner while preserving the environment both locally and globally. Energy efficiency and conservation are essential factors in meeting these challenges.

Low-cost energy is essential to economic growth in the US and throughout the developed and developing world, particularly in nations with large and rapidly growing populations. Today fossil fuels account for 85% of the world's energy supplies and forecast to account for 87% by 2030. Demand for energy is growing rapidly and global energy use – provided by fossil fuels – will likely double over the next thirty years.<sup>6</sup>

*Population & Food* – Changes in population size, age, and distribution affect issues ranging from food security to climate change. Population variables affect consumption patterns, technologies, and political and economic structures that influence environmental change. The interaction between the variables helps explain why environmental conditions can deteriorate even as the growth of population slows.<sup>7</sup>

Despite slowing growth, world population still gains nearly 80 million people each year, parceling land, fresh water, and other finite resources among more people. How an increase in population affects specific environmental problems is difficult to determine. However, trends such as loss of half the planet's forests, the depletion of most of its major fisheries and the alteration of its atmosphere and climate are closely related to the fact that

human population expanded from mere millions in prehistoric times to nearly 6 billion today.<sup>8</sup>

*Water Shortage* – Rapid population growth in developing countries is contributing to critical environmental degradation along with an inadequate water supply. Lack of sanitation services is imposing large health problems and burdensome economic costs on the poor. Water supply sources are being stretched to their limits, and many parts of the world are facing water scarcity. Sanitation facilities are either lacking or are being overloaded, and surface and groundwater pollution is increasing rapidly. Over 1 billion people still do not have access to safe water supplies and over 1.7 billion do not have access to adequate sanitation facilities.<sup>9</sup>

*Marine Degradation* – Over half of the world's nearly 6 billion people live within 60 kilometers of the shoreline. This concentration of population is largely the result of the tremendous productivity of coastal ecosystems, the health of which is vital to sustaining not only coastal communities but also human society as a whole. These natural systems – including salt marshes, mangrove forests, coastal wetlands, coral reefs and estuaries – are under unprecedented stress from land-based activities. In fact, municipal, industrial and agricultural wastes and run-off account for some 70 to 80% of all marine pollution. Pollution of the marine environment from land-based sources poses a major global environmental challenge for the 21<sup>st</sup> century.<sup>10</sup>

*Declining Forests* – As we move towards the 21<sup>st</sup> century, forests will be under increasing pressure to meet the rising demand for forest products created by population growth and economic development. This pressure will present new opportunities to advance the development of sustainable forest management, develop new and more efficient industrial processing technologies, and promote a greater understanding of the important role of forests in the global environment.<sup>11</sup>

## **Sustainable Development**

The Bruntland Report *Our Common Future* defines sustainable development as “development that meets the needs of the present without compromising the ability of future generations to meet their own needs”.<sup>12</sup> A further refinement of this definition is required in the ecological sense. The definition of ecologically sustainable development is “using, conserving and enhancing the community's resources so that ecological processes, on which life depends, are maintained, and the total quality of life, now and in the future, can be increased”.<sup>13</sup> The continued existence of life on this planet depends on nature's provision of resources. Society must look at the issues and impacts of development and assess the need for corrective actions to remediate the trend of ecological degradation. Ecological sustainable development problems fall into five theme areas. Each area by itself involves enormous technological and behavioral challenges but, taken together, the task is almost overwhelming

**Atmosphere:** The concentration of greenhouse gases – carbon dioxide, methane, and others are increasing dramatically, resulting in scientifically demonstrated **climate change**. The amount of carbon dioxide, for example, has increased by more than 30% since pre-industrial times and is currently increasing at an unprecedented rate of about 0.4% per year, mainly due to the combustion of fossil fuels and deforestation.<sup>14</sup> Expectations are that continued

accumulation of greenhouse gases is expected to lead to rising temperatures, more severe weather events, increased ecosystem stresses, shifting precipitation patterns, increased ranges of infectious diseases, and coastal flooding.<sup>15</sup> Attaining sustainable development will necessitate widespread international agreement, willingness to change behavior, and a massive application of advanced technology.

**Land:** “Agriculture plays a pivotal role in the context of sustainable land use. The sector is being called on to both increase production to achieve food security and improve its stewardship of the land resource. In addition, agriculture supports social and economic development, and the maintenance of rural lifestyles. If practiced in a sustainable manner, it contributes to the conservation of the countryside and related natural resources.”<sup>16</sup>

**Oceans, Seas, and Coasts:** The earth’s surface is comprised of over 70% water. Oceans and seas are highly productive ecosystems that continually recycle chemicals, nutrients, and water. This recycling process regulates global weather, climate and temperature. Continuing development of these areas provides important economic benefits such as fisheries, tourism and recreation. As with healing the atmosphere, progress in the oceans, seas and along coasts will come about only if international stakeholders are willing to agree, change behaviour, and apply technology.

**Coastal zones** accommodate over 2 billion people, more than one-third of the world’s population, and contribute <sup>17</sup> to about 80% of marine pollution. Over half the world’s coastal ecosystems face risk of degradation because of inappropriate development. “The primary ecological services coastal ecosystems provide are biodiversity both on land and underwater and pollutant filtering. Coastal wetlands, mangroves, sea grasses, and peat swamps could be considered the lungs of the oceans for their ability to filter pollutants. Loss of this habitat not only decreases biodiversity but also the ability of a coastal ecosystem to soak up pollutants from human activities, such as farming, aquaculture, urban runoff, sewage effluent, and oil spills.”<sup>18</sup>

**Fresh Water:** “Freshwater is essential to support human life, ecosystems, and economic development. It supports domestic water supplies, food production, fisheries, industry, hydropower generation, navigation, and recreation. The ecosystem services of freshwater systems include food production, reduction of flood risk, and the filtering of pollutants. The global issues of health, poverty, climate change, deforestation, desertification, and land use change are all directly associated with the water resource and its management. The long-term sustainability of water is in doubt in many regions of the world. Water use has been growing at more than twice the population rate, and a number of regions are already **chronically short of water**. About one third of the world’s population lives in countries with moderate to high water stress. With population increases, economic growth and rising living standards, as much as two thirds of the world’s population could be living in water-stressed countries by 2025.”<sup>19</sup>

**Biodiversity:** Perhaps the greatest challenge to sustainable development is in the area of biodiversity. “Biological diversity consists not only of variety among species, but also genetic variation within species, and variation between communities of species, habitats and ecosystems. This biodiversity of genes, species, and ecosystems contributes essential

products and services to human welfare. Maintaining biodiversity helps ensure that the Earth will continue to perform natural ecological processes upon which all life depends. Major changes, loss, or degradation of biodiversity can result in serious economic, social, and cultural impacts; and have profound ecological and ethical implications. More than 40% of the world's economy and about 80% of the needs of the world's poor are dependent upon biological diversity. Food security, climatic stability, freshwater security and human health needs are all directly associated with the maintenance and use of biodiversity.”<sup>20</sup>

### **Economic Drivers and Financial Conditions in the Environment Industry**

There are two key economic issues affecting the environment industry. First, the market typically does not “price in” the detrimental externalities associated with activities that harm the environment. Consequently, often there is little market incentive to curtail harmful activities. Second, is determining the most effective and efficient method of enforcing environmental protection laws and regulations: government command and control (CAC) or the use of market driven economic instruments (EIs). Both methods can and have enhanced the environmental industry and spurred the use of innovative technology.

Most environmentally damaging activities are said to generate detrimental externalities because they harm the environment but little or no effort is made to determine the true cost of the harm and to collect that cost from the offending company. For example, how does one determine a fair compensation for the amount of harm created by the air pollution emitted by coal fired power plants? One could argue that the plant compensates its customers for polluting their air by providing lower cost electricity to them; however, the plant does nothing to compensate their non-customers, even though their pollution may reach far into neighboring states. Until the government, or market, can force companies to internalize all of the costs of their offending activities, which is extremely difficult, there will be no market incentive for them to fully address the detrimental externality they are imposing through their abuse of the environment. This is because they are profiting from their “free” use of common air, water, or land. Thus, one economic driver which influences the environment industry is, lacking any other incentive, the propensity for companies to cause as much environmental damage as the law will permit (avoiding the cost of employing environment industry services) since they are not required to internalize the total cost of their damage.

The other key economic driver of the environment industry is which method the government uses to enforce compliance with its environmental protection laws: command and control or economic instruments. CAC is a regime in which the government promulgates laws for the protection of the environment and then uses inspections and litigation to force compliance. In order for command and control to be effective, “the rules must be unequivocal and the standards uniform. This regime works best when 1) conformity to the laws and regulations is feasible (for example, the necessary technology is available and economically viable) and 2) *there is no compelling reason to go beyond the specified standards* (emphasis added).”<sup>21</sup> While this method of enforcement can be effective since it relies on inspectors verifying compliance in tandem with the threat of fine or imprisonment for failure to do so, it is usually not as efficient as using market mechanisms to alter the negative effects of most environmentally damaging activities

because it does not incentivize companies to exceed the government mandated standards.

Economic instruments use market mechanisms to encourage compliance with government environmental policies. According to the United Nations Environmental Programme, “EIs can accomplish a number of important changes in market dynamics. First, the cost of pollution is shifted more effectively back onto polluters than with CACs. While CACs often allow emissions/resource extraction below the regulatory threshold to occur for free, EIs tend to price all units of pollution/resource use. This encourages people to use goods and services that do less environmental damage, and polluting firms to control more than required in order to sell their excess to others at a profit. EIs reduce compliance costs by allowing polluters to allocate pollution reductions more heavily where they are less expensive to achieve. EIs include policy instruments such as permits, quotas, licenses, concessions, user fees, use taxes, access fees, impact fees, performance bonds, deposits, rights to sue, and financial assurance. Taken together, EIs are structured to achieve some mix of three main objectives: establishing, clarifying or improving property rights; ensuring that resource users or polluters pay a fair price for what they consume or pollute; and subsidizing cleaner alternatives. In addition, many EIs have the benefit that they generate revenues for the public sector.”<sup>22</sup> The primary advantage of using market driven methods to gain compliance with environmental protection laws is that the market incentivizes companies that reduce their environmentally damaging activities beyond government mandated standards. Because companies have an economic incentive to reduce their pollution as much as possible, they end up stimulating the market to generate cleaner technologies and processes. This leads to even further pollution reduction.

### **Financial State of the Environment Industry**

The passage of the National Environmental Policy Act in 1969 led to a multitude of environmental protection laws. Because many of these laws mandated changes from the way business had previously been conducted, “classic” environmental industry segments like remediation, hazardous waste management, and sales of air pollution control equipment boomed in the 70s and 80s. However, the traditional “clean up” segment of the industry continues to wane as companies have become more proactive in preventing environmental harm. Overall, the financial health of the revenue generating industry is solid, but not spectacular. EBI projects the U.S. market in the aggregate will grow 18% by 2010 before flattening out while the global market will remain relatively flat at 2-3% annual growth.<sup>23</sup> The bottom line with the industry financial state is that some segments will continue to decline, some will grow with the economy, and some will strengthen as demographic pressures increase demand.

## **Individual Considerations**

**Environmental Activism and Education.** The need for education on the environment has evolved from the conservation movements of the early 20<sup>th</sup> century to today's developed awareness of the interconnections with science, technology and impacts to the quality of life for the world's population. The goal of the education is to develop an understanding of the relationship between humans and their many environments – natural, man-made, cultural and technological. Environmental education is concerned with knowledge, values attitudes and has as its aim responsible environmental behavior.<sup>24</sup> The education of the public occurs through government and non-governmental organizations (NGOs), which come in various forms and with various agendas.

Environmental activist groups run the gamut from small grassroots and community organizations to large international pressure groups such as the World Wildlife Fund, Friends of Earth, Nature Conservancy, Greenpeace, and the Sierra Club. Environmental NGOs focus on specific issues such as water, air or land management or take on a broad range of environmental problems. NGOs such as the World Resources Institute concentrate on providing policy and scientific advice while others will use a strategy that is more aggressive in lobbying politicians and “in your face” type tactics. Earth First is one direct action group that has taken violent action to their cause. Funding for these groups vary from accepting only individual private donations to a combination of corporate and government funding.

Depending on the issue, these groups are far more politically savvy than the activist movements of the 1960's and 70's. NGOs such as OneWorld.net have posted kits and strategies on their website for use by environmental activists. Their site states that “A wide arrange of strategies and tools is at the disposal of environmental activists: direct violent and non-violent actions against polluters; media, consumer and Internet campaigns; public education and research; networking; advocacy, lobbying and litigation for political and legal recognition of environmental values and rights; partnerships with other sectors of society; and use of market mechanisms to promote sustainable consumption and production.”<sup>25</sup> The strategy for many of these groups is to have a more balanced approach to decision making by to using Diplomatic (lobbying, institutions), Informational (press, education, science based), and Economic (partnering with institutions such as the World Trade Organization) for instruments. These groups are very sophisticated in their decision making of what instrument to use and the risks and benefits associated with each.

**Research and Development Technology.** Research and development within the environmental industry casts a very wide net. From glass fixation to seaweed, only the creativeness of an innovator's mind limits the new environmental technology. Several examples will follow to demonstrate just how diverse the R&D is within the environmental industry. The first is the use of glass as an environmental protector through a technology known as vitrification. Vitrification is a flexible technology that atomistically bonds the hazardous material in a solid glassy matrix.<sup>26</sup> In this glassy matrix, “The waste forms produced are durable and environmentally stable over long term durations.”<sup>27</sup> Some of the by-products of vitrification are even recyclable which makes the process even more eco-friendly. Currently, vitrification is possible on industrial wastes, sludges, lead paint, cement, and radioactive waste, to name a few. In addition, the EPA has declared vitrification the

best demonstrated available technology for high-level radioactive waste.<sup>28</sup>

Another technology deals with the serious environmental problem of storm water runoff within urban areas and the impact on the rivers and streams that the runoff contaminates. This technology is “green roofs.” Instead of using traditional roofing materials and having the rain flow into the sewer system, many areas are creating green roofs. These green roofs trap rainwater for use by plants or evaporation. “Research conducted at Michigan State University has shown that 66 percent of the precipitation was retained by an extensive green roof studied over an average of 24 rainfall events.”<sup>29</sup> Again, technology creates a simple solution to a complex problem.

Finally, how do we prevent landfills from being filled with demolition debris? The answer is deconstruction. “The Deconstruction Institute estimates a typical 2,000 square foot home produces 127 tons of demolition debris.”<sup>30</sup> To prevent this debris from entering the landfills, deconstruction is another simple technology. Using deconstruction on a typical 1,500 square foot home, 75 percent of the materials are either reused or recycled.<sup>31</sup> When you combine the environmental savings with the fact that U.S. deconstruction costs average 30 to 50 percent less than demolition costs,<sup>32</sup> deconstruction is the preferred technology.

Finally, no one industry has more innovations than energy. Clean-energy is the way of the future. Renewable energy technology and R&D initiatives are numerous and directly impact the overall environmental industry. This new technology includes vast improvements in hydroelectric power, geothermal electric production, geothermal heat pumps, and solar cells, but this section will focus on several new improvements that could help the United States with its fossil-fueled energy demand. Some of the promising new technologies include wind power, harnessing ocean tidal power, coal gasification, hydrogen energy, bioreactors, and “nuclear batteries.”

**Environmental Management Systems.** Over the past two decades public and private organizations have come to recognize the value of managing the environment. This trend has been helped along by both government regulation<sup>33</sup> and the recognition that an EMS makes good practical and fiscal sense.<sup>34,35</sup> To that end, modern EMS developments represent the next evolutionary step in man’s awakening to the fact that man is inseparable from the environment. Competing definitions aside, at its core an EMS represents the result of the gestalt that environmental management must be treated just like any other core business process. It must be organized, structured, and with a commensurate level of rigor ingrained into the operations, if not the culture, of the organization.

One of the most far-reaching Environment Management Systems is the International Standards Organization (ISO). It is a non-governmental, non-profit organization established in 1947 to develop standards that are designed to make the development and production of services and goods more efficient and effective.<sup>36</sup> It is important to note that ISO standards are in and of themselves completely voluntary in nature.

The 14000 series of ISO standards contains process descriptions for standards regarding the management of the environment. This series consists of seventeen distinct subprocesses that structure and facilitate the organized management of an organization and

its interaction with the environment. These seventeen subprocesses consist of the following:

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- **Environmental Policy** - develop a statement of the organization's commitment to the environment
- **Environmental Aspects and Impacts** - identify environmental attributes of products, activities and services and their effects on the environment
- **Legal and Other Requirements** - identify and ensure access to relevant laws and regulations
- **Objectives and Targets** - set environmental goals for the organization
- **Environmental Management Program** - plan actions to achieve objectives and targets
- **Structure and Responsibility** - establish roles and responsibilities within the organization
- **Training, Awareness and Competence** - ensure that employees are aware and capable of their environmental responsibilities
- **Communication** - develop processes for internal and external communication on environmental management issues
- **EMS Documentation** - maintain information about the EMS and related documents
- **Document Control** - ensure effective management of procedures and other documents
- **Operational Control** - identify, plan and manage the organization's operations and activities in line with the policy, objectives and targets, and significant aspects
- **Emergency Preparedness and Response** - develop procedures for preventing and responding to potential emergencies
- **Monitoring and Measuring** - monitor key activities and track performance including periodic compliance evaluation
- **Nonconformance and Corrective and Preventive Action** - identify and correct problems and prevent recurrences
- **Records** - keep adequate records of EMS performance
- **EMS Audit** - periodically verify that the EMS is effective and achieving objectives and targets
- **Management Review** - review the EMS

Although elaborate, the ISO 14000 series is an extremely generic management model that could be used to manage any complex issue. Additionally, the model can be implemented from the aspect of any organization regardless of size, scope, or mission. One of the most significant issues with the ISO 14000 series is that it provides a voluntary structure only and mandates nothing other than making conscious risk based decisions. This is in stark contrast to the Environmental Management System in development in the European Union.

The European Union (EU) Eco-Management and Audit Scheme (EMAS) was initially established in 1995 by EU Council Regulation as a management tool for environmental performance in the industrial sector.<sup>38</sup> Its utilization has since been expanded and opened to all economic sectors. The most significant differentiation between the ISO 14000 series and EMAS is that under EMAS an external audit is required to become EMAS certified, whereas under ISO 14000 organizations are essentially self certifying. Under EMAS, externally accredited auditors review and validate the EMS program in its entirety with specific attention to the policy statement, management system and audit cycles.<sup>39</sup> An organization can only claim EMAS registration and display the distinctive EMAS logo following a successful accreditation.

**Government, Industry, and Environmental Responsibility.** Since the genesis of the Environmental Movement, several key conflicts have arisen that shape the debate about the

government's role in environmental issues. An understanding of these tensions will help us better conceptualize the intent and evolution of environmental policy.

*Conservation vs. Preservation* – If Rachel Carson's *Silent Spring* gave birth to environmental activism in 1962, then Earth Day marked its coming of age. Wednesday, April 22<sup>nd</sup>, 1970, the first Earth Day, represented the public institution of environmental preservation activism. Protection of the environment, not conservation of natural resources, was the emphasis at that first Earth Day. This dichotomy between preservation (absolute protection of resource status quo) and conservation (efficient use of resources) has left ghosts that still haunt contemporary debates. Along with the protection vs. conservation argument, strong "tension between national goals and state preferences"<sup>40</sup> is another enduring element of the US environmental policy debate as it matures into the 21<sup>st</sup> Century.

*Federal vs. State* – In the first half of this century, the environmental law of the land was essentially held by the states, and that state law was essentially conservationist. "In the 1950s Congress provided increased funding for treatment plants on the condition that states adopt pollution-control plans. By the mid-1960s, however, Congress had become impatient with the slow progress of the states."<sup>41</sup> It was at this point that federal regulatory authority began to impact how all states managed their environmental resources. Politicians from Kennedy to Nixon to Reagan<sup>42</sup> picked up the cause of the environment and ran with it.

The National Environmental Policy Act of 1969 (NEPA) gave the Earth Day revelers something to crow about as it firmly established preservation of endangered species as a priority over all other government activity. NEPA was the grandfather of federal environmental regulation and along with a dozen other laws, forms the legislative marching orders for the Environmental Protection Agency (EPA).

*Public Property vs. Private Property* – The balance between private property rights and environmental protection is a tough one for lawmakers. Government regulation of public land was a relatively easy pill to swallow for the American public, but the one glaring problem with government regulation was that its reach was required to go far beyond only publicly held land. Although it was a public requirement, it would largely apply to private property. In practice, the government achieves a balance when laws regulate activities on private property solely with respect to the commons that transcend fences and boundaries. Examples of such laws include the Clean Air Act (CAA) and the Safe Drinking Water Act (SDWA).<sup>43</sup>

*Regulation vs. Partnership* – There can be little doubt that market forces were insufficient to force the type of radical change necessary when environmental concerns first came to the forefront of American political consciousness. Regulation by federal, state and local government had its place as the environmental health enforcer when one was necessary to cure our ecological ills. The Clean Air Act; the Clean Water Act; the Safe Drinking Water Act and Superfund are a few examples of federal government action that forced industry to clean up its damaging activities.

As US history marches forward, environmental activism is gradually giving ground to new environmental pragmatism<sup>44</sup>; an attitude that the health of our environment and the

conservation of our natural resources are inseparable, and that the best way to curb pollution is to work with the polluters, rather than militantly opposing them. The emphasis is shifting from the dramatic – and necessary – role of environmental activism over the last three decades; the pioneers of protection who brought the environment to public awareness have left the stage. Concerned patriots in both public and the private sectors must lead the way forward. The regulatory environment created a “race to the bottom,” where polluters managed to just meet regulatory standards as inexpensively as possible in order to be deemed compliant; then market themselves as an environmentally responsible company. A better solution involves the “race to the bottom line” in which companies create environment-friendly processes on their own, constantly improving environmentally friendly processes beyond the limits of regulation in order to enhance their bottom lines. The current trend is a partnership between the government and industry that promises to take environmental consciousness out of tie-dye and into a business suit.

**Defining “Environmental Security.”** Promoting a workable American definition of environmental security means more than abstractions. Such a definition must also include tangible issues that have a demonstrated level of bipartisan interest. These issues may not be ones where our two parties agree on solutions, but they at least agree that the issues exist. Three areas that meet this standard are: access to strategic natural resources, encroachment, and intrastate or ethnic conflict driven by scarce or degraded resources.

*Access to Strategic Natural Resources.* Resource access is an issue that enjoys wide bipartisan recognition. Although strategies to ensure access may vary, there is little debate that the mere fact of access has a significant impact on national security. Oil is the resource most frequently referenced in this context. In the 2002 NSS, the Bush administration stated:

We will strengthen our own energy security and the shared prosperity of the global economy by working with our allies, trading partners, and energy producers to expand the sources and types of global energy...<sup>44</sup>

President Bush’s 2004 presidential opponent, Senator John Kerry, shared access concerns. Bush proposed increasing energy production, while Kerry proposed curtailing consumption. Both, however, clearly saw a causal relationship between energy and security. Kerry’s party nomination acceptance speech depicted that linkage in provocative fashion:

...our energy plan for a stronger America will invest in new technologies and alternative fuels and the cars of the future – so that no young American in uniform will ever be held hostage to our dependence on oil from the Middle East.<sup>45</sup>

*Encroachment.* Encroachment – or the relationship between military activities and their impact on the environment – also enjoys widespread recognition as a viable issue. However, the issue of encroachment is subtly different than many other suggested linkages between the environment and security. Most conceptual linkages reflect the idea that

environmental degradation can worsen the security environment. Encroachment reflects the idea that environmental protection can worsen the security environment. This occurs when environmental protection regulations lessen the ability of military units to effectively conduct needed training. Our two political parties clearly see the impact of encroachment differently. Democrats tend to focus on preventing environmental degradation over promoting unbounded military training. (As Democratic Senator Barbara Boxer said in 2003, “How sad it would be if our military hurt the health and safety of our citizens here at home by ignoring environmental laws that apply to every other entity...”<sup>46</sup>) Republicans tend to focus on the inverse, fearing that environmental regulations will weaken war-fighting abilities. (Since President Bush took office, the Pentagon has won exemptions from the Migratory Bird Treaty Act, the Marine Mammal Protection Act, and the Endangered Species Act.<sup>47</sup>) While the two parties may seek divergent goals in the encroachment arena, both can agree that there is a linkage between military readiness and the environment.

*Intrastate or Ethnic Conflict Driven by Scarce or Degraded Resources.* The reality of resource scarcity (either due to natural limits or human-induced degradation) as a cause of conflict is the element of environmental security that enjoys the least amount of bipartisan support. While Democrats have embraced this notion (the fourth line of Clinton’s 1996 NSS states, “Large-scale environmental degradation, exacerbated by rapid population growth, threatens to undermine political stability in many countries and regions”<sup>48</sup>), Republicans tend to be less sanguine over this theme. Little rhetoric can be found from any prominent Republican that reflects the connection between conflict and resource scarcity. The Millennium Challenge Corporation (arguably the arm of the current administration most associated with achieving security through international economic growth) developed criteria for awarding aid that notably lack any reference to environmental sustainability.<sup>49</sup>

Nevertheless, there are some indications that Republicans could embrace this concept.

Buried on page 16 of the 2002 Bush NSS is a recognition that some conflicts are driven by resource pressures, “Ultimately the path of political and economic freedom presents the surest route to progress in sub-Saharan Africa, where most wars are conflicts over material resources.”<sup>50</sup> In 2004, Secretary of State Colin Powell testified before the Senate that the root cause of the conflict in Darfur was resource competition between nomadic herders and farmers.<sup>51</sup> Republican recognition of the link between resources and conflict seems dependent on a de facto demonstration.

Republicans and Democrats both seem willing to recognize that resource competition is connected to security. The difference between the two degrees of recognition perhaps lies in the fidelity by which a resource competition is depicted. Broadly drawn connections may not be enough. However, where scarce resources undeniably contribute to conflict all parties can accept a concept of environmental security.

Given the introduction of the three bipartisan elements of American environmental security, the definition requires expansion. The elements of maintaining access to strategic resources and preventing intrastate resource competition are embodied in the original definition. Encroachment, however, is not. Thus, “environmental security” can now be defined as *the ways that states maintain healthy and sustainable access to necessary natural resources so as to ensure the individual liberties of citizens while maintaining an effective*

*and ready military.* This definition may seem elongated and less than graceful. It does not address emerging international concepts of security, nor does it fully consider the nascent roles of non-state actors. However, it represents a meaningful interpretation of the relationship between the environment and security in a fashion that can enjoy bipartisan support in the United States.

## **Regional Overviews**

*North and Northeast Asia.* North and Northeast Asia (including China) is a region experiencing tremendous economic growth. Over the past thirty years, this region has grown faster economically than any region in the world with its largest economies in China, Indonesia, the Republic of Korea, Malaysia, the Philippines, Singapore, Taiwan, and Thailand.<sup>52</sup> People lucky enough to participate in the wave enjoyed an increased standard and quality of living. However, massive economic expansion has been at the cost of the environment and the health of its people. As with most developing nations, the pursuit of economic strength, through the exploitation of their natural resources with minor attention to the environment and the welfare of their people, is a familiar phenomenon.

North and Northeast Asia will continue to grow an exponential rate. With market economies dictating much of the growth, there is a dynamic tension between economic expansion at the expense of the environment. As the middle class in this region increases, so does the demand for resources such as water, air, and natural resources. Industrialization, as one major engine of economic expansion, has major implications on the environment. Uncontrolled release of untreated waste, the burning of highly polluting fuels, high demand for natural resources, and the increased need for water for its processes conjures up a dangerous package for disaster. However, major environmental laws and regulation have been established demonstrating incremental improvements in the areas of environmental measures and technology. The central point is that as the region develops it must take deliberate action to apply the latest in environmental practices and technology to avoid a huge economic cost in the future if they are ready to take serious environmental action for the long term.

*Europe and the Former Soviet Union.* The status of the environment in Europe varies greatly from region to region. The 22 countries of Western Europe have high environmental standards but consume a lot of resources. In the 18 central and eastern European states, including those of the European Union (EU) enlargement, environmental problems are increasing with the development of business. The former states of the Soviet Union have vast tracts of unspoiled nature and the environment there is in better condition than it was in Soviet times, due to the drop in traffic and industry. On the other hand, toxic waste and inefficient irrigation are problems. The restructuring of agriculture is also reducing biodiversity. Raw materials supplies are being produced for export to Western Europe, generating huge environmental pollution.

According to the European Environmental Agency's third environmental report,<sup>53</sup> the state of the environment in Europe has improved significantly since the last report was made in 1998. There are far fewer emissions of substances that harm the ozone layer, less air pollution and improved air quality. There are also localized improvements in

biodiversity, due to the designation and protection of natural areas. On the other hand, the state of the environment continues to be unsatisfactory in a number of areas. Insufficient waste and water management, over-fishing, soil erosion and a loss of soil fertility are major issues. The most problematic areas for Europe are increased air pollution in towns with transition economies, the increased concentration of new chemical pollutants, and lands contaminated by toxic waste.

Despite the remaining environmental challenges, the overall situation of the environment is much more favorable in some key areas, such as biodiversity and protection of natural areas. At the level of the European Union and at the national level, there has been some progress in developing policies that integrate environmental requirements into decision-making, but there is much progress to be made in implementing these on a pan-European scale. Using advanced environmental technologies, all European countries must take full account of environmental implications when making economic policy. This is the key to sustainable development while protecting the environment.

*South and Southeast Asia.* In the last century, most countries in South and Southeast Asia have undergone tremendous social, political and economical transformation. Economies that were largely agrarian have become highly industrialized. Globalization has made this economy export-oriented and connected to the global market. Researchers at the University of Hawaii and Singapore's Institute of Policy Studies have found that the production sector is expanding at a rate that far exceeds the capacity of many countries to cope with the attendant environmental stress. A high rate of industrialization and rapid economic growth has changed a lot of aspects of life in this region; however, the quality of life still remains poor for most people. At least one in three Asians has no access to safe drinking water and at least one in two has no access to sanitation.<sup>54</sup> Urbanization, industrialization and high population density have accelerated environmental degradation and led to a substantial increase of air and water pollution. Additionally, a combination of poverty and population pressure has forced many people to move to ecologically fragile areas.

Rapid economic development combined with the problems brought on by urbanization will continue to pressure the regional environment. Although most countries have environmental protection ministries or agencies, a lack of political will to enforce policies that may stifle economic growth will continue to plague the region. There are some promising trends, but overall the region needs dedicated world support to overcome its burgeoning environmental issues.

*Middle East and North Africa.* Environmental issues do not receive the attention in this region over the military, economic, and political issues. Environmental issues, however, contribute to or become the underlying issue of conflict. Issues such as the Israeli-Palestine conflict over groundwater beneath the West Bank and Gaza Strip and the Turkish dam construction on the Tigris and Euphrates rivers have contributed to the political, and often military, events in this region.<sup>55</sup> Major regional challenges include poor water quality and a scarcity of water, land and coastal degradation and desertification, industrial pollution and weak institutional and legal frameworks to deal with environmentally harmful activities.

Strategic initiatives posed by the World Bank and the Regional Consultation for the

Northern Africa and Middle East will require strong leadership, collaboration, and coordination with stakeholders from throughout the world. Undoubtedly, water is the primary environmental challenge for this region, but not the only concern. These actions will require the increased dedication and cooperation of NGOs and international financial institutions. The course of actions chosen to increase development in this region must be selective in choosing environmental activities that continue to emphasize affordability and realism in concert with the individual countries' development objectives. Direct foreign investment in this region can produce significant global and regional economic benefit. It is hoped that this often-neglected region can improve its productivity and close the prosperity gap while promoting environmentally sustainable development.<sup>56</sup>

*Latin America.* The environment in Latin America is important to its people, its government, and its businesses, but that has not always been the case. Latin America has been developing economically for decades, but with little concern for the adverse impacts on the environment. For approximately the last 15 years there has been some evidence that this situation is changing as more businesses adopt pollution abatement measures and environmental management systems, but still few firms have obtained ISO 14000 certification.<sup>57</sup> Overall regional governments and foreign and domestic industry have made some efforts at environmental conservation, but Latin America's development is still far from environmental sustainability.

The quality of air and water in Latin America very much affects air and water quality throughout the world. The global atmosphere and water bodies are connected, and air and water pollution have trans-boundary effects. For example, the Amazon River system produces over 20 percent of the freshwater that pours into the earth's oceans.<sup>58</sup> During Latin America's industrial boom air quality deteriorated; atmospheric emissions from the transport, industrial, and agricultural sectors, and deforestation are the leading causes of degraded air quality.<sup>59</sup> Water quality has also eroded. The region's two most serious water problems are a reduction in available water reserves and a drop in quality. "Reserves are reduced because of deforestation, urban development, and agricultural and industrial growth."<sup>60</sup> "The drop in quality is caused by untreated sewage, excessive use of fertilizers and pesticides, and industrial and mining pollution."<sup>61</sup> In the past three decades water withdrawal has doubled in the region.<sup>62</sup>

Latin America is similar to China in that the region is focused very much on economic development at the expense of its environmental resources. However, since Latin America's resources arguably have a greater impact on global air and water quality than any other region on earth, all nations should be interested in its environment. Elizabeth Economy states, with regard to China's efforts at environmental protection, in her book *The River Runs Black*, "...much more remains to be done. Technology transfer and adoption of new policy approaches await the development of a stronger legal and enforcement apparatus. Here, the international community, in particular the U.S. with its strong environmental enforcement apparatus and history of public participation in environmental protection, could be far more active in contributing to the development of China's environmental future."<sup>63</sup> The U.S. should have particular interest in Latin America's environment due to its geographic location and the trans-boundary effects of air and water pollution. "The U.S. gains from improved standards of living in Latin America far more

than from economic growth in any other region in the world.”<sup>64</sup>

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